1-8. DEF, FBT BOARDS

(1) Outline

Horizontal and vertical deflection are performed by this board based on the HD and VD supplied from the interface board. It also generates and controls the high voltage, etc., supplied to the CRT.

(2) Circuit Description

a) Vertical Deflection Circuit

IC202 operates as an unstable multivibrator, determines the period according to the VD pulse supplied from the interface board, and drives D209.

A sawtooth waveform is created by IC203 and Tr213. When D209 is switched ON, a reset is applied, Pin ① of IC203 is grounded. When the reset is released, it goes in the minus direction and the output voltage drops linearly.

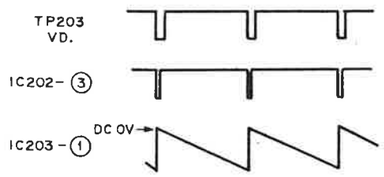


Fig. 1-8-1.

The level of the sawtooth waveform, in other words the height on the screen, is determined by the DC voltage at IC203-⑦. With the IC203-① waveform, the image only appears from the center to lower portion of the screen as the waveform only fluctuates from GND to down. DC bias is applied to Pins ⑤ and ⑥ of IC204 so that center of the sawtooth waveform is DC = 0 even if height control is at any position.

b) Horizontal Deflection Circuit

IC102 and LA7850 form the core of the horizontal deflection drive circuit. These ICs form the following four circuits :

① Shifts the HD supplied from the interface board and controls the H. phase.

② The phase of the pulse created by ① is compared with that of the flyback pulse of the horizontal output circuit, to control the frequency and phase of the oscillation circuit. (AFC circuit)

③ DC is received from the protection circuit, and the deflection and drive pulses are shut off.

④ The AFC time constant is selected together with the IC for time constant switching. Although the IC102 oscillation circuit is normally oscillated at 15.75kHz, it is oscillated at 63kHz here as this monitor requires a 4fH pulse as the trigger for the power supply circuit. The output (Pin ⑫) is divided by 4 by IC301, passes through a buffer, and becomes the drive pulse.

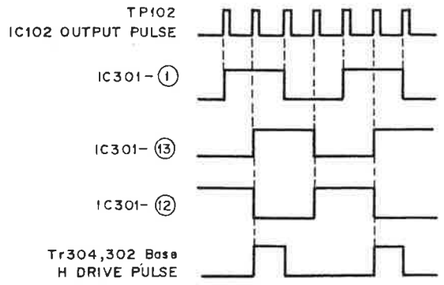


Fig. 1-8-2.

The current of the drive pulse is amplified by Tr605 and T601, and drives Tr505 (horizontal output transistor).

The horizontal deflection output current is applied to Pin ③ of T501 through D515. This voltage is compared with the width control DC voltage by the regulator formed from IC501, Tr502, Tr503, and Tr504, and stabilized.

In addition, the vertical output waveform is applied to IC501 and the double integrated parabola waveform to Pin ③. Side pin correction is also performed at the same time.

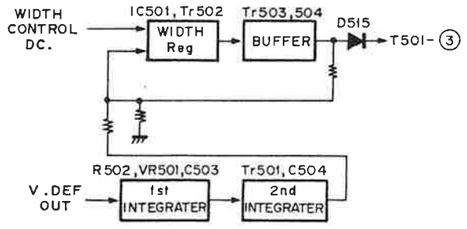


Fig. 1-8-3.

c) High-Voltage Output Circuit

In the same manner as the horizontal output circuit, a drive pulse is supplied to the high voltage output circuit from the secondary side of T601, and high voltage is output by the flyback method.

The high-voltage output is stabilized by controlling the power to Pin ③ of the flyback transformer by the series regulator formed by Tr606, Tr608, Tr609, Tr610, Tr611, and Tr612.

d) **Protection Circuit**

The protection circuit shuts down the high-voltage output by raising the DC voltage at Pin ⑬ of IC201 in one of the following cases, caused by a malfunction of the deflection and high-voltage circuits.

① When the high - voltage output rises abnormally and the flyback pulse level becomes higher than the set position.

② When pulse waveform at both sides of L602 is no longer output by the loss of the current determined by L602 connected to the cold side of the horizontal deflection yoke.

③ When there is no longer any sawtooth waveform at the cold side of the vertical deflection yoke or an extreme shift in the DC bias.

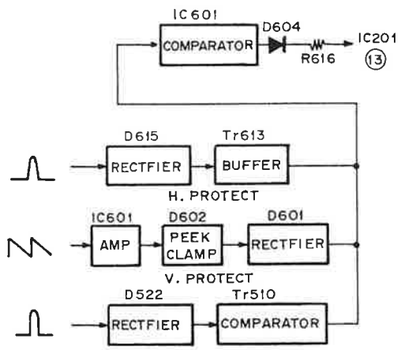


Fig. 1-8-4.

e) **Horizontal Centering Circuit**

The horizontal deflection yoke allows adjustment of the deflection position by the DC current applied through L601. This control is performed by IC602 which inputs the DC for H. CENT control. Tr614 and Tr615 function as buffer for this.

f) **Rotation Adjustment Circuit**

This is the circuit which controls of the DC current applied to the rotation coil to cancel the horizontal magnetic field applied to the monitor.

The current to the rotation coil all pass through R260. The voltage generated by this current is compared with the reference voltage, and controlled so that there is always constant current flow.

(3) Adjustment Procedure

a) **VR101 (H. PHASE)**

① Apply a monoscope signal, etc., to the input.

② Turn ("U-SCAN") the SIZE WIDE/U-SCAN switch.

③ Adjust VR101 so that the video is at the center of the rasters on the screen.

b) **VR102 (H. HOLD)**

① Adjust VR102 so that there is horizontal sync on the screen.

c) **VR103 (P. WIDTH)**

① Connect the probe to TP102.

② Adjust VR103 so that the pulse width is 4 μs.

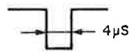


Fig. 1-8-5.

d) **VR201 (V. HOLD)**

① Adjust VR201 so that there is vertical sync on the screen.

e) **VR202 (MIN HEIGHT)**

① Connect the probe to TP205.

② Move the OPERATE/SET-UP switch to the "SET-UP" position.

③ Adjust VR202 so that the level is 0.38Vp-p.

Fig. 1-8-6.

f) **VR203 (DC OFFSET)**

① Connect the probe to TP205.

② Set V. CENT to a position 2.5 turns from the MIN using the rotary encoder.

③ Adjust VR203 so that the ratio of the levels of ⓐ and ⓑ in Fig. 1-8-7. is 1 : 1 centered on GND.

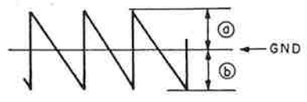


Fig. 1-8-7.

g) **VR204 (V. LIN1)**
VR205 (V. LIN2)
① Select CH BAR using the VIDEO SELECT switch.
② Adjust VR204 and VR205 so that there is vertical linearity over the entire screen (visually observed).

h) **VR206 (BIAS)**
① Eliminate crossover on the screen using VR206 only when either Tr203 or Tr204 is replaced and crossover can be confirmed on the screen.

i) **VR207 (MAX PAL)**
① When the height is altered, adjust VR207 so that V.CENT no longer moves on the screen.

j) **VR501 (SIDE PIN PHASE)**
VR502 (SIDE PIN AMP)
① Select CH BAR with the VIDEO SELECT switch.
② First set VR502 to MAX.

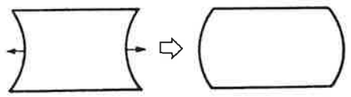


Fig. 1-8-8.

③ Adjust VR501 so that portion with maximum lateral protrusion comes into the center as shown in Fig. 1-8-9.

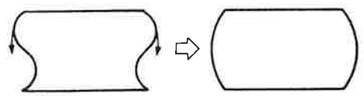


Fig. 1-8-9.

④ Adjust VR502 so that the vertical lines on the left and right of the screen are straight.

k) **VR503 (HV PROTECTION)**
VR1 (HV. ADJ) ···< FBT BOARD >
① Connect a high-voltage meter to the anode of the CRT.
② Use VR1 on the FBT board to set the high-voltage in the following manner.
TM14-15 ··· 27.5kV
TM20-15 ··· 30.0kV
③ Set contrast and brightness to manual, and set contrast and brightness to the position where the ABL begins to operate. (The position where the ABL begins to operate refers to the position where the luminance decreases when the contrast and brightness are increased.
④ Use VR503 to set to the position where the protection begins to operate.
Turn (OFF) the POWER switch at this time.
⑤ Slightly lower VR1 on the FBT board and turn (ON) the POWER switch.
⑥ Use VR1 to adjust the high-voltage level to the following.
TM14-15 ··· 25kV
TM20-15 ··· 27kV

Precaution ····· VR1 (FBT BOARD)
VR503 (DEF BOARD)
This control is not for field servicing and is fixed with glue after setting to avoid X-ray radiation which may cause one component failure in the circuit and misadjustment of this control. The sealing method is shown in the diagram.

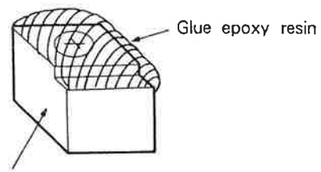
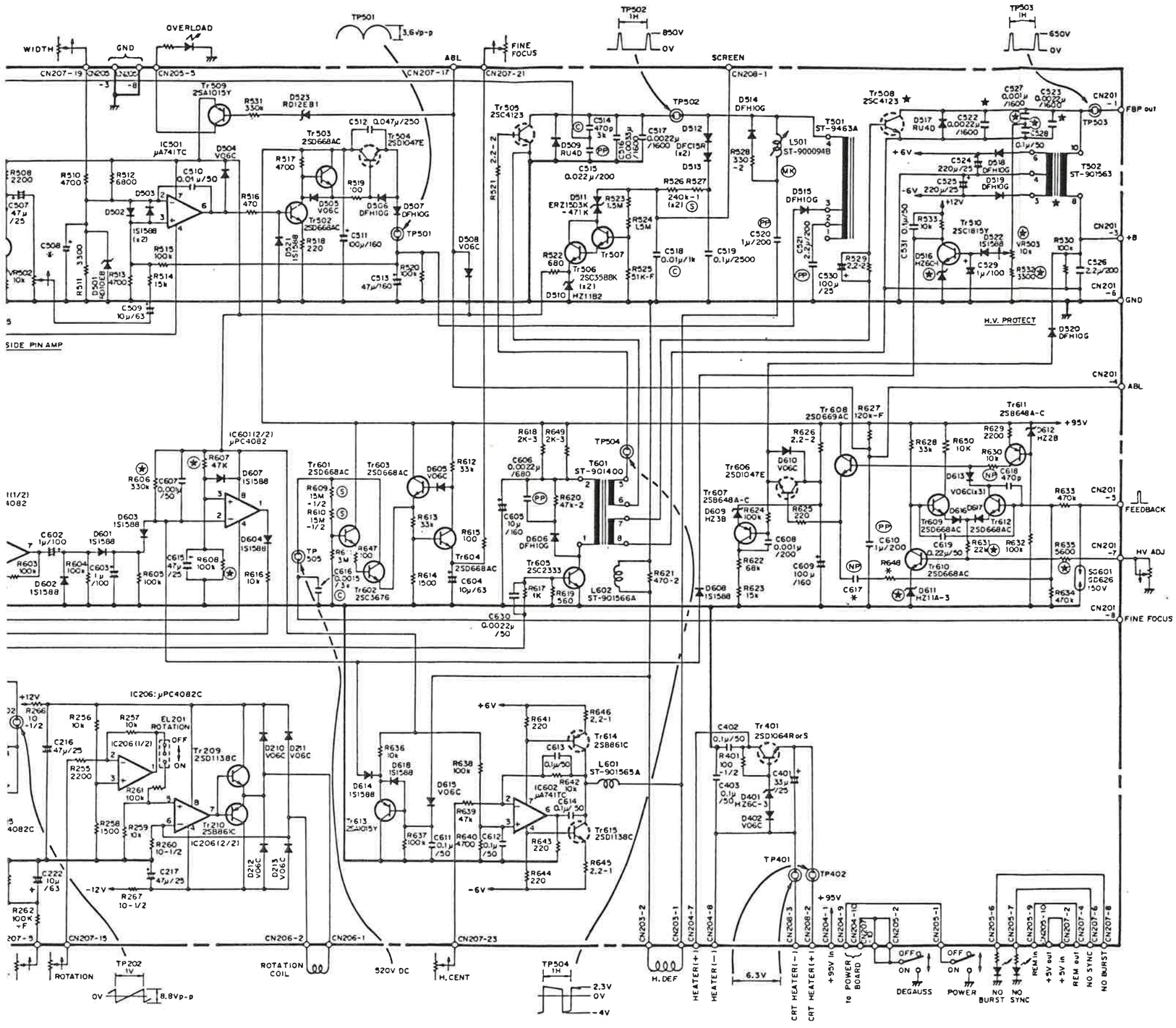


Fig. 1-8-10.

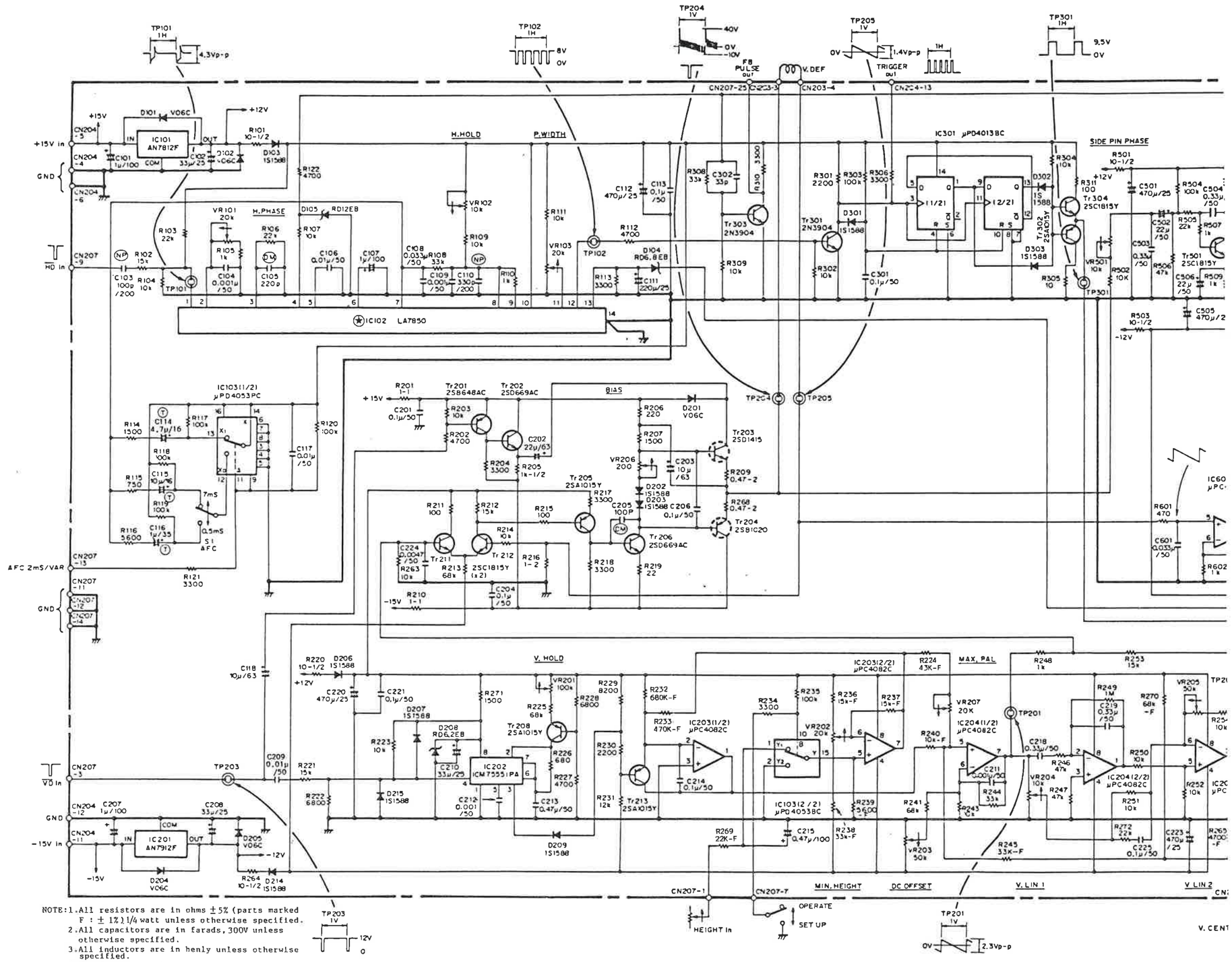
This adjustment is required when replacement of the parts marked with ★, ✪ in the schematic diagram of the DEF BOARD and FBT BOARD is done.

l) **L501 (H LIN)**
① Select CH BAR with the VIDEO SELECT switch.
② Adjust L501 so that there is horizontal linearity over the entire screen (visually observed).

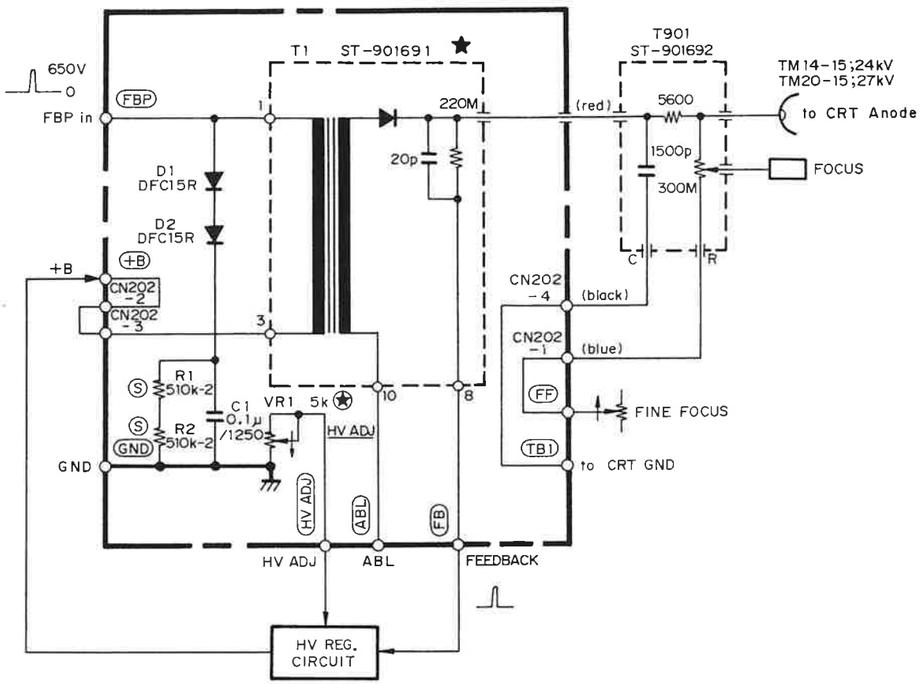
052



MODEL TM14/20-19
COLOR MONITOR
DEF BOARD
SCHEMATIC DIAGRAM

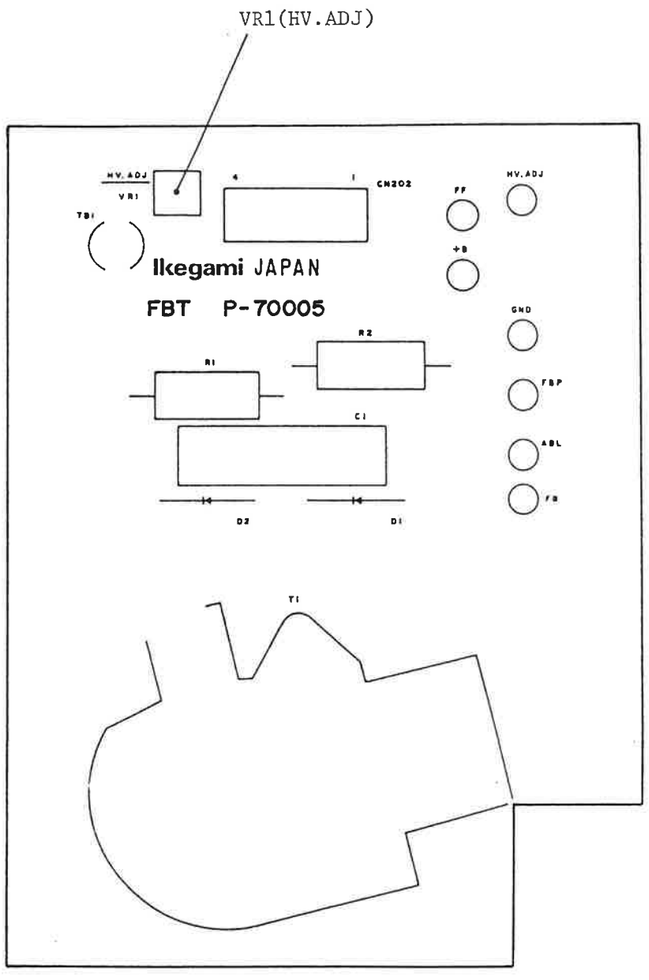


NOTE: 1. All resistors are in ohms ±5% (parts marked F : ± 1%) 1/4 watt unless otherwise specified.
2. All capacitors are in farads, 300V unless otherwise specified.
3. All inductors are in henly unless otherwise specified.
4. Waveforms are taken with a color-bar signal input.
5. Parts marked ※ are factory selected value.
6. Parts marked ★ , ⊛ are critical components for X-RADIATION.

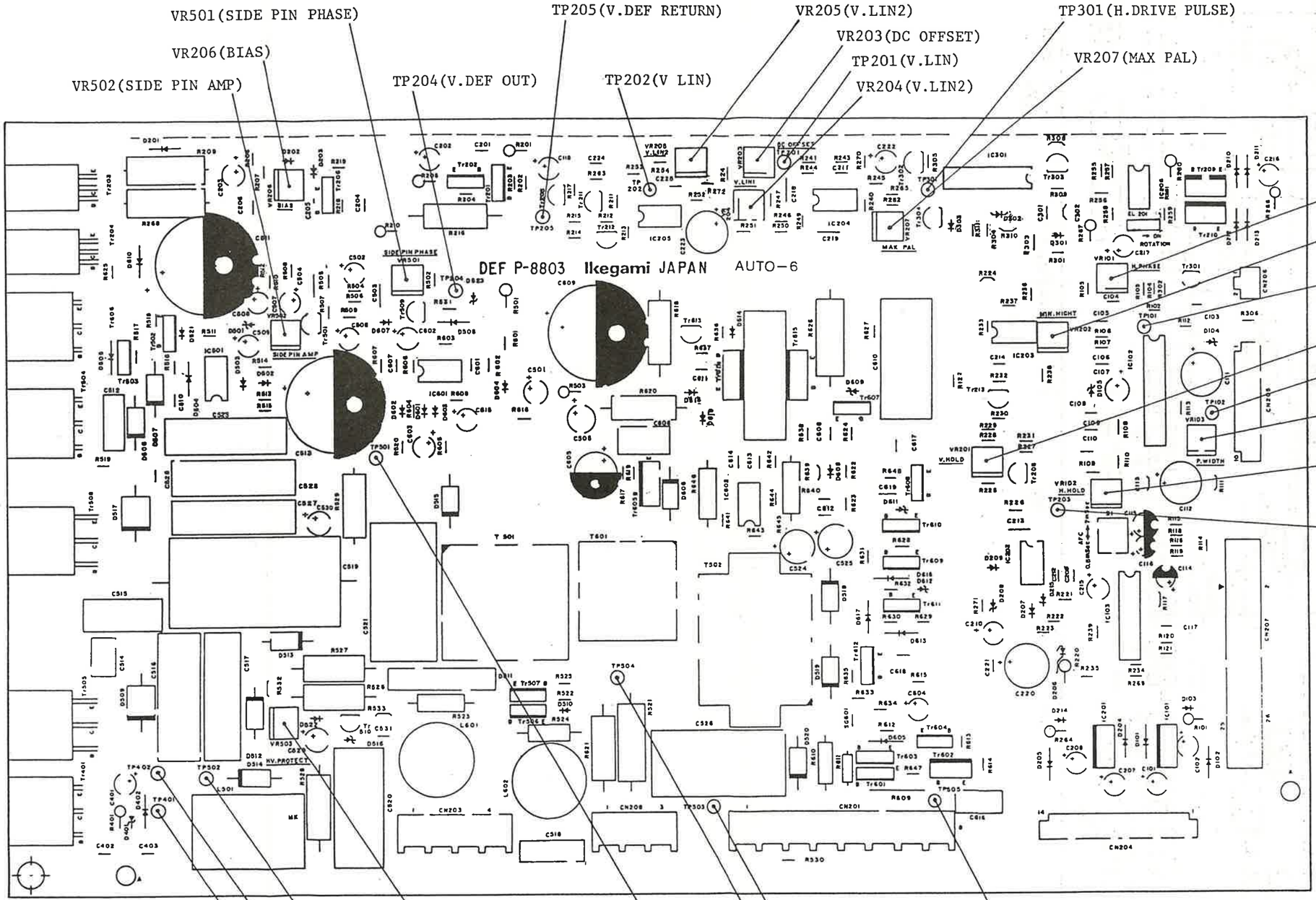


NOTE: 1. All resistors are in ohms ±5% (parts marked F; ±1%), ¼ watt unless otherwise specified.
2. All capacitors are in farads , 300V unless otherwise specified.
3. All inductors are in henly unless otherwise specified.
4. Waveforms are taken with a color-bar signal input.
5. Parts marked ※ are factory selected value.
6. Parts marked ★ , Ⓚ are critical components for X-RADIATION.
7. Parts marked ⚠ are special component for safety requirement.

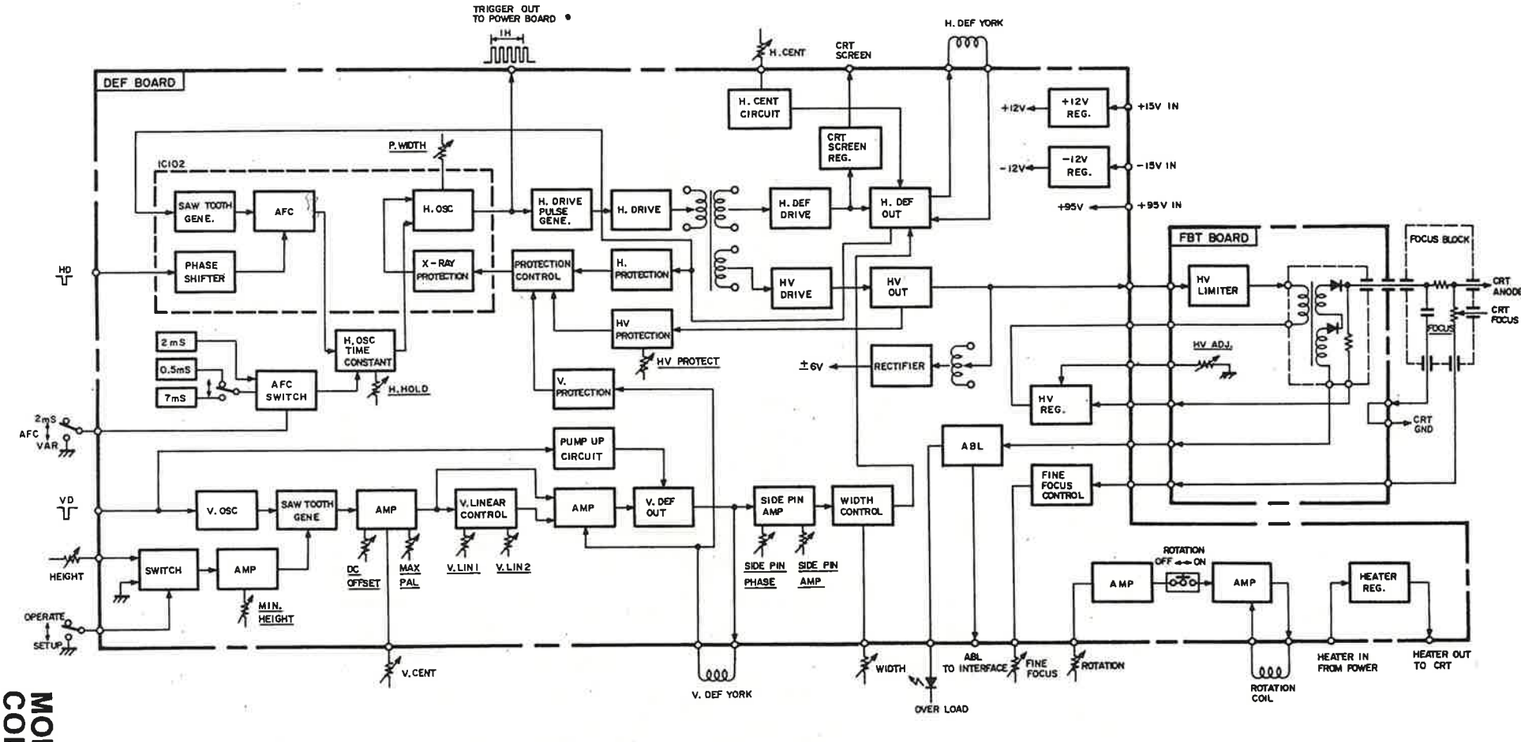
MODEL TM14/20-19
COLOR MONITOR
FBT BOARD
SCHEMATIC DIAGRAM
C4-903413



MODEL TM14/20-19
COLOR MONITOR
FBT BOARD
PARTS LOCATION
P-70005



MODEL TM14/20-19
COLOR MONITOR
DEF BOARD
PARTS LOCATION
P-8803



MODEL TM14/20-19
COLOR MONITOR
DEF & FBT BOARD
BLOCK DIAGRAM
C3-903598